# FACIES ARCHITECTURE, GEOCHEMISTRY AND TECTONIC SIGNIFICANCE OF THE URAL VOLCANICS AND THE MOUNT HOPE VOLCANICS, CENTRAL LACHLAN OROGEN, NSW

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CODES

Submitted in fulfilment of the requirements
for the degree of Doctor of Philosophy

University of Tasmania
Australia
May, 2006

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Date: 12 May, 2006

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# ABSTRACT

This study focuses on facies analysis, geochemistry, geochronology and tectonic significance of the Ural Volcanics (UV) and Mount Hope Volcanics (MHV) in the Central Lachlan Orogen in New South Wales. The UV and MHV overlie non-volcanic sedimentary, below wave base, submarine facies within two intracontinental rift basins, the Rast and Mount Hope Troughs. The UV and MHV consist primarily of felsic, coherent facies and associated felsic monomictic breccia facies. These volcanic facies are interpreted to represent submarine lava-sill complexes, which define intrabasinal, effusive, volcanic and shallow intrusive centres. The UV include at least 35 separate lava or sill emplacement units that amount to ~10 km$^3$. In the MHV, at least 18 lavas and sills are present, and have thicknesses up to ~120 m. The combined volume of the two largest MHV units is estimated to be $\leq$1.5 km$^3$.

In the UV, siltstone-matrix monomictic breccia facies is characterised by continuously laminated siltstone matrix between monomictic, non-vesicular, felsic clasts. This facies is interpreted to form from water-settled sediment deposited between lava clasts, and must therefore occur on the upper margin of a lava. The presence of conformable, continuous laminae helps to distinguish this facies from peperite. Hence, correct identification of the siltstone-matrix monomictic breccia facies is critical in distinguishing lavas from sills.

The autoclastic facies in the UV and MHV account for up to 10% of single emplacement units. In most cases, the clasts have blocky or slabby shapes and are flow-banded, implying that autobrecciation was the main fragmentation mechanism. Neither *in situ* or resedimented hyaloclstite are recognised in the UV or MHV, in contrast to other submarine felsic lavas and domes elsewhere.

Pumice-rich volcaniclastic facies in the UV and MHV are less voluminous than the coherent and monomictic breccia facies. The UV pumice-rich facies are interpreted to represent felsic pyroclastic facies erupted in a single, open-vent explosive eruption from a local vent and transported in, and deposited from, submarine gravity currents (pumice-rich facies association),

and settled from suspension in the water column (fiamme-siltstone breccia facies). Similar syn-eruptive pyroclastic facies occur in the MHV, but their source has not been identified.

Fiamme-bearing facies occur in both the UV and MHV, in fiamme-bearing pyroclastic facies and as pseudoclastic textures. Fiamme textures can also be formed in a variety of other ways. The common genetic use of the term fiamme for textures produced by welding compaction is easily misinterpreted. 'Fiamme' would be better used descriptively to mean elongate lenses or domains of the same mineralogy, texture or composition, which define a pre-tectonic foliation, and are separated by domains of different mineralogy, texture or composition.

Results from LA-ICPMS U/Pb dating of zircons indicate that the UV and the MHV were roughly coeval and erupted in the Late Silurian-Early Devonian, within the time period ~420-410 Ma. Both successions consist of dacites and rhyolites and have A-type to transitional I-type geochemical affinities. High-level, felsic, A-type plutons with myrmekitic and/or granophyric texture occur in both study areas. Geochemistry suggests they are comagmatic with the volcanic facies. Cross-cutting mafic to intermediate dykes and small intrusions are not comagmatic with the felsic coherent facies.

A modern analogue for the UV and MHV felsic has not been recognised. The closest analogue is the Late Devonian-Early Carboniferous Iberian Pyrite Belt (IPB). Parts of the IPB contain similar felsic coherent, monomictic breccia facies, and syn-eruptive pyroclastic facies as the UV and MHV. The IPB volcanic rocks are also A-type in composition. The numerous similarities of the IPB to the UV and MHV suggest the Australian successions have great potential for hosting volcanic-hosted massive sulfide (VHMS) deposits, however, neither previous exploration nor mapping during this study have uncovered any VHMS-related altered zones or prospects.

# TABLE OF CONTENTS

CHAPTER 3. FACIES AND FACIES ASSOCIATIONS OF THE URAL VOLCANICS, URAL RANGE AREA

# LIST OF FIGURES

## CHAPTER 1



## CHAPTER 2



## CHAPTER 3

## CHAPTER 4



## CHAPTER 5



## CHAPTER 6

## CHAPTER 7



## CHAPTER 8



## CHAPTER 9

# LIST OF TABLES